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Original Article

Saphenous nerve injury during harvesting of one or two hamstring tendons for anterior cruciate ligament reconstruction☆

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ABSTRACT

Objective: The aim of this study was to assess whether harvesting of two hamstring tendons (semitendinosus and gracilis) has the same rate of nerve injury as harvesting of the semitendinosus tendon alone, used as a triple graft.
Methods: Changes in sensitivity relating to injury of the infrapatellar branch of the saphenous nerve were evaluated in 110 patients six months after they underwent anterior cruciate ligament (ACL) reconstruction using hamstring tendons. They were divided into two groups: one in which only the semitendinosus was used and the other, the semitendinosus and gracilis.
Results: The group in which only the semitendinosus was used as a graft presented a nerve injury rate of 36.1%. In the group in which the semitendinosus and gracilis tendons were used, 58.1% of the patients presented altered sensitivity. In the general assessment on all the patients, the nerve injury rate was 50.9%.
Conclusion: Harvesting the semitendinosus alone and using it in triple form is a viable option for ACL reconstruction and may give rise to fewer nerve injuries relating to branches of the saphenous nerve.

Lesão do nervo safeno na retirada de 1 ou 2 tendões flexores na reconstrução do ligamento cruzado anterior

Palavras-chave:
Ligamento cruzado anterior
Parestesia

RESUMO

Objetivo: Avaliar se a retirada dos dois tendões flexores (semitendíneo [ST] e grácil [GC]) tem o mesmo índice de lesão nervosa que a retirada isolada do tendão ST usado como enxerto triplo.

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Tendões flexores

Métodos: Foi avaliada a alteração de sensibilidade relacionada à lesão do ramo infrapatelar do nervo safeno em 110 pacientes seis meses após serem submetidos à reconstrução do LCA com o uso dos tendões flexores, dividido num grupo no qual se usou somente o ST e outro com o ST e o GC.

Resultados: O grupo no qual se usou somente o ST como enxerto apresentou um índice de lesão nervosa de 36,1% e no grupo com os tendões ST e GC 58,1% dos pacientes tiveram alteração da sensibilidade. Na avaliação geral de todos os pacientes o índice de lesão nervosa foi de 50,9%.

Conclusão: A retirada do ST isolado e usado de forma tripla é uma opção viável na reconstrução do LCA e pode ocasionar um menor número de lesão nervosa relacionada a ramos do nervo safeno.

Introduction

Anterior cruciate ligament (ACL) injuries, which are incapacitating for certain physical activities because of the instability that is caused, predispose toward meniscal and cartilage lesions that may evolve to arthrosis.[1] ACL reconstruction seeks to restore joint stability.

With the evolution of surgical procedures for ACL reconstruction, patients' expectations regarding the results are becoming greater. They seek to return to their daily activities earlier and with less morbidity.[2]

The tendons that are most used for this procedure are the flexor tendons (semitendinosus and gracilis) and the central third of the patellar ligament. The literature shows that the results from using these two grafts are similar,[3–6] but it is believed that using the flexor tendons leads to lower postoperative morbidity.[7]

However, graft harvesting is not risk-free. The commonest complication is regional paresthesia or anesthesia in the leg, caused by injury to the infrapatellar branch of the saphenous nerve (IPSN). There have been reports of incidence greater than 70%.[8,9]

To reduce the incidence of this complication, some authors have chosen to use a more oblique incision,[10] while others have attempted to explore and identify the nerve at the time of harvesting the graft.[2]

The aim of the present study was to compare whether harvesting a flexor tendon (semitendinosus) has the same incidence of nerve injuries as does harvesting of both tendons (semitendinosus and gracilis) by means of a vertical incision, for use as grafts in ACL reconstruction.

Materials and methods

Six months after the operation, 110 patients who had undergone ACL reconstruction using flexor tendons were assessed. A triple graft from the semitendinosus tendon was used when remnants of the torn ACL had been preserved or when the diameter of the graft was greater than 8 mm, for a total of 36 patients.

When there was no remnant ACL or the semitendinosus tendon did not reach a diameter of 8 mm, the reconstruction was done using a quadruple graft from the flexor tendons (semitendinosus and gracilis), while always maintaining their distal insertion in the tibia, for a total of 74 patients.

Patients who had not undergone suturing of the medial meniscus using the "in-out" or "out-in" technique (in which a small medial incision was made) were not included in the evaluation. Likewise, patients with scars or previous surgery on the knee were also not included.

Surgical technique

ACL reconstruction was performed using a tourniquet at the base of the thigh and spinal anesthesia in all cases.

The procedure was started with harvesting of the semitendinosus tendon by means of a vertical incision that was made approximately 1.5 cm medially and distally to the anterior tuberosity of the tibia, with an average length of 2.8 cm. The fascia of the sartorius, which covers the flexor tendons, was opened horizontally and, with the aid of two "mixters", the semitendinosus was isolated and harvested by means of an open stripper (pigtail type), while maintaining its distal insertion in the tibia.[6]

The muscle portion was cleaned and the arthroscopic procedure was started through conventional anteromedial and anterolateral portals. After treatment of the associated lesions, the existence of any viable remains of the ACL was ascertained. The femur was then prepared for drilling the tunnel, which was done by means of independent "out-in" drilling, following the technique of Chambat.[11]

In the tibia, when there were viable remains of the ACL, we did the drilling using the remains as the location. With the aid of a shaver, a path within the remains was created.[12]

When there were no remains of the ACL or these were unviable, the tibial tunnel was constructed within the tibial footprint, using the anterior cornu of the lateral meniscus and the medial tibial spine as the location parameter. In this case, or when the triple graft from the semitendinosus presented a diameter of less than 8 mm, we returned to the incision over the flexors and harvested the gracilis tendon in the same manner.

After the graft had been prepared, it was passed through from distal to proximal, while maintaining its distal insertion

Table 1 – Incidence of nerve injuries.

		Sensitivity[a]		Total
		Normal	Altered	
Number of tendons				
1 tendon (ST)	*n*	23	13	36
	% of tendons	63.9%	36.1%	100.0%
2 tendons (ST and GC)	*n*	31	43	74
	% of tendons	41.9%	58.1%	100.0%
Total	*n*	54	56	110
	% of tendons	49.10%	50.90%	100.0%
Chi-square test		χ^2 (df = 1) = 4.689; $p = 0.030$		

[a] For columns with difference letters, their proportions present a significant difference at the probability level of 5%.

in the tibia. The fixation was done using interference screws, firstly in the tibia and secondly in the femur, from out to in, close to the extension.

No drains were used. The patients were released 24 h after the operation, and at this time physiotherapy was started, with progressive partial weight-bearing with the aid of crutches for 15 days.

The patients were assessed six months after the operation and they were asked to define the area over which altered sensitivity was present in the leg that had been operated.

Statistical analysis

The data were summarized in tables showing the total numbers of individuals and the absolute frequencies and percentages for the qualitative variables.

Associations between sensitivity (normal or altered) and the number of tendons (semitendinosus or semitendinosus plus gracilis) were ascertained using the Pearson chi-square test, and the z test was used to make comparisons between the proportions of the columns.[13]

Results

Altered sensitivity was found in 36.1% (13/36) of the patients in whom only the semitendinosus tendon had been used as a graft; and in 58.1% (43/74) of the patients in whom both tendon had been used (semitendinosus and gracilis). In the general evaluation with all the patients, 50.9% (56/110) presented nerve injuries (Table 1).

The result from the chi-square test was significant ($p = 0.030$) and made it possible to state that there was greater occurrence of altered sensitivity after the surgery when both of the tendons (semitendinosus and gracilis) were used. In the group in which only one tendon (semitendinosus) was used, it was observed that the proportion of the individuals who presented normal sensitivity (63.9%) was greater than the proportion with altered sensitivity (36.1%). This was the inverse of the situation in the group in which two tendons (semitendinosus plus gracilis) were used, since the proportion of the individuals with normal sensitivity (41.9%) was lower than the proportion with nerve lesions (58.1%).

Discussion

ACL reconstruction using flexor tendons is not free from complications. The commonest of these is injury to a branch of the saphenous nerve, for which the reported incidence can be as high as 77%.[8,9]

This is most commonly seen in the infrapatellar branch (IPSN), which crosses the anterior region of the knee, well below the patella.[14] This branch is perpendicular and at risk of injury because of the vertical incision that is made for harvesting the flexor tendons and because of the wound caused by the arthroscopy portal.[14,15]

Luo et al.[10] compared the incidence of nerve injuries in relation to flexor tendon harvesting, between use of oblique and vertical incisions, an *d* concluded that oblique incisions led to a nerve injury rate of 24% versus 56% for vertical incisions.

Papastergiou et al.[16] used vertical incisions to harvest the patellar ligament and found that 39.7% of the patients presented nerve injuries. Saglione et al.[8] harvested only the semitendinosus and found that 37.5% presented injuries, which was similar to the findings from our group that used the semitendinosus alone, in which the rate was 36.1%.

Mochizuki et al.[17] reported that the incidence of altered sensitivity through harvesting of the flexor tendons was 58%, which was similar to the findings from our group in which both flexor tendons were harvested and the rate was 58.1%.

During the procedure for harvesting grafts from the flexor tendons, Mirzatolooei and Pisoodeh[2] isolated superficial branches of the saphenous nerve and preserved them. They reported that their nerve injury rate was 20.5%, in comparison with a rate of 72% among patients in whom the superficial nerve branches were not found. They also reported that 9.8% of the patients who presented altered sensitivity said that this was on the medial face of the leg, and made the supposition that this alteration was not related to injury of the IFSN branch but rather, to injury of the sartorius branch of the saphenous nerve (SBSN). The latter presents an initially vertical path together with the sartorius muscle and it emerges in the subcutaneous layer between the tendon of the sartorius and the gracilis. It then continues distally together with the saphenous vein and is responsible for the innervation of the knee, lower leg and ankle.[3,18] This type of injury is thought to be related to the passage of the stripper.[3,19]

SBSN injuries were also described by Sanders et al.[19] In their study on 164 patients, they found that 23% presented injury of the SBSN alone and 19% of the IPSN alone, while 32% had these injuries concomitantly. They concluded that SBSN injuries due to passage of the stripper may be more common than is reported in the literature, because the path of this nerve is very close to the gracilis in the distal region of the thigh.

In our study, 36.1% of the cases of harvesting the semitendinosus alone presented nerve alterations, whereas 58.1% with harvesting of the semitendinosus and gracilis did so. This difference was statistically significant. We only had one case in which altered sensitivity was reported to be experienced in the region of the SBSN, in a patient from whom both tendons were harvested.

In an attempt to avoid SBSN injury, some authors[20] have advised that the flexor tendons (and especially the gracilis) should be harvested with the knee in a "figure-four" position, so as to relax the saphenous nerve. However, others[19] have reported that nerve injuries occurred even with this harvesting technique.

Preservation of one of the flexor tendons (gracilis) in ACL reconstructions may lead to lower incidence of nerve injuries and less loss of muscle strength, which may be beneficial for the rehabilitation.

Conclusion

Harvesting of the semitendinosus alone, for use in triple form in ACL reconstruction, may be a viable grafting option with lower risk of injury to branches of the saphenous nerve in comparison with using grafts from both the semitendinosus and the gracilis.

Conflicts of interest

The authors declare no conflicts of interest.

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